3. Document ID: US 6751635 B1

L1: Entry 3 of 3 File: USPT Jun 15, 2004

US-PAT-NO: 6751635
DOCUMENT-IDENTIFIER: US 6751635 B1

TITLE: File deletion and truncation using a zombie file space

DATE-ISSUED: June 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Chen; Ray	Campbell	CA		
Edwards; John K.	Sunnyvale	CA		
Patel; Kayuri	Cupertino	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/642066 [PALM]
DATE FILED: August 18, 2000

INT-CL-ISSUED: [07] G06 F 17/30

US-CL-ISSUED: 707/200; 707/10, 707/202, 707/206
US-CL-CURRENT: 707/200; 707/10, 707/202, 707/206

FIELD-OF-CLASSIFICATION-SEARCH: 707/10, 707/201, 707/203, 707/206, 707/204, 707/205, 707/200, 707/202, 711/113, 711/114, 709/203, 709/219, 709/229
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4888681	December 1989	Barnes et al.	707/101
4937763	June 1990	Mott	702/183
5067099	November 1991	McCown et al.	702/183
5088031	February 1992	Takasaki et al.	709/100
5155835	October 1992	Belsan	711/114
5193184	March 1993	Belsan et al.	711/4
5317728	May 1994	Tevis et al.	707/204
5403639	April 1995	Belsan et al.	707/204
5535375	July 1996	Eshel et al.	703/27

5557747	September 1996	Rogers et al.	709/223
5564037	October 1996	Lam	711/161
5617568	April 1997	Ault et al.	
5832522	November 1998	Blickenstaff et al.	707/204
5946685	August 1999	Cramer et al.	707/10
5963962	October 1999	Hitz et al.	707/202
5991753	November 1999	Wilde	707/2
5996054	November 1999	Ledain et al.	711/203
6026402	February 2000	Vossen et al.	
6041334	March 2000	Cannon	707/204
6101508	August 2000	Wolff	709/223
6112211	August 2000	Bradshaw et al.	707/205
6173293	January 2001	Thekkath et al.	707/201
6247024	June 2001	Kincaid	707/204
6249792	June 2001	Zwilling et al.	707/205
6289356	September 2001	Hitz et al.	707/201
6334114	December 2001	Jacobs et al.	705/26
6353878	March 2002	Dunham	711/162
6366988	April 2002	Skiba et al.	711/165
6529921	March 2003	Berkowitz et al.	715/500.1
2002/0083081	June 2002	Chen et al.	
2002/0089508	July 2002	Sowizral et al.	345/522

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
694 25 658	August 2000	DE	400/332.4
0 474 395	August 1991	EP	
0537098	April 1993	EP	
702 815	August 2000	EP	
WO 94/29807	December 1994	WO	
WO 00/11553	March 2000	WO	
WO 02/19110	August 2001	WO	

OTHER PUBLICATIONS

Rodriquez et al., A new Checkpoint Mechanism for real time Operating System, Undated, Univerdisad Politecnica de Madrid, Spain, pp. 55-62.*
Ott et al., SRED: Stabilized RED, undated, Bellcore and Bell Laboratory, pp. 1-10.*
Chung et al., Checkpointing in CosMiC: a User-level Process Migration Environment, 1997 IEEE, pp. 187-193.*
Elnozahy et al., A Survey of Rollback-Recovery Protocols in Message-Passing Systems, ACM Computing surveys, vol. 34, No. 3, Sep. 2002, pp. 375-408.*
Kleiman et al.; Using NUMA Interconnects For Highly Available Filers; IEEE Micro. 1999; pp. 42-48. XP002164052.
Chia Chao et al., "Mime: A High Performance Storage Device With Strong Recovery Guarantees", Concurrent Systems Project, HP Laboratories, Mar. 18, 1992.
Dave Hitz, James Lau & Michael Malcolm, Network Appliance, Technical Report 3002, Rev. C 3/95, "File System Design for an NFS File Server Appliance", Usenix Winter 1994, San Francisco, CA, 1994 The Usenix Association, Jan., 1994.

David Hitz, "Technical Report TR01: An NFS File Server Appliance", Rev. A 8/93, Network Appliance Corporation, Santa Clara, CA.
Mulqueen, John T., Product Analysis Review. Communications Week, vol. 452, p. 25, May 3, 1993.
John Ousterhout & Fred Douglis, "Beating the I/O Bottleneck: A Case for Log-Structured File Systems". Electrical Engineering and Computer Sciences, UC Berkeley, CA, Oct., 1988.
Network Appliance. Data ONTAP Event Management System, Aug. 10, 2000.
David Simpson, "`Appliances` Take Over File Server Role", Digital News and Review, vol. 11, No. 6, pp. 1-2, Mar. 21, 1994.
TUX 2: Slashdot.com TUX 2 "The File System That Would Be King", Microsoft Internet Explorer, Oct. 20, 2000.
Gray et al. "Transaction processing: Concepts and techniques." 1993, Morgan Kaufmann, San Francisco, pp. 724-732.
Hutchinson et al. "Logical vs. physical file system back up." Third Symposium on Operating Systems Design and Implementation, New Orleans, LA, USA, Feb. 22-25, 1999, pp. 239-249.

ART-UNIT: 2177

PRIMARY-EXAMINER: Homere; Jean R.

ASSISTANT-EXAMINER: Wong; Leslie

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

A method and system for reliably performing extra-long operations in a reliable state-full system (such as a file system). The file system includes a separate portion of the file system reserved for files having extra-long operations in progress, including file deletion and file truncation. This separate portion of the file system is called the zombie file space; it includes a separate name space from the regular ("live") file system that is accessible to users, and is maintained as part of the file system when recording a consistency point.

27 Claims, 4 Drawing figures

Term	Documents
ZOMBIE	193
ZOMBIES	57
FILESPACE	37
FILESPACES	4
(FILESPACE NEAR ZOMBIE).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	3
(ZOMBIE NEAR FILESPACE).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	3

Display Format: - Change Format

Previous Page Next Page Go to Doc#

Hit List

First Hit Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 3 of 3 returned.

☐ 1. Document ID: US 20050033775 A1

Using default format because multiple data bases are involved.

L1: Entry 1 of 3 File: PGPB Feb 10, 2005

PGPUB-DOCUMENT-NUMBER: 20050033775
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050033775 A1

TITLE: File deletion and truncation using a zombie file space

PUBLICATION-DATE: February 10, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Ray	Campbell	CA	US
Edwards, John K.	Sunnyvale	CA	US
Patel, Kayuri	Cupertino	CA	US

US-CL-CURRENT: 707/200

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

☐ 2. Document ID: US 20020083081 A1

L1: Entry 2 of 3 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020083081
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020083081 A1

TITLE: Manipulation of zombie files and evil-twin files

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Raymond C.	Campbell	CA	US
Edwards, John	Sunnyvale	CA	US
Patel, Kayuri	Cupertino	CA	US

US-CL-CURRENT: 707/200

First Hit Previous Doc Next Doc Go to Doc#

Generate Collection Print

L6: Entry 5 of 16 File: PGPB Sep 4, 2003

DOCUMENT-IDENTIFIER: US 20030167287 A1
TITLE: Information protection system

Detail Description Paragraph:
[0061] The file checking process may perform an additional check for unauthorized zombie files at the target location 110. If a file is found at the target location 110 that is not contained in archive 100, then the file is checked to determine if it is a zombie file. This zombie file check may include checking the file against a list of files and folders that are to be excluded for checking for added files. If the file is in the exclusion list, then the added file is ignored. If the file is not in the exclusion list, then the file at the target location 110 may be copied into quarantine area 120 and removed from the target location 110. The zombie file check process may be utilized to prevent hackers from placing files on a web site with the intent of using the web server as a Zombie server to host their files.

Detail Description Paragraph:
[0062] A file quarantine process in accordance with various aspects of the present invention, referring now to FIG. 9, suitably uses a quarantine area 120 to hold files that have been detected as altered files or as zombie files, so that the files may be later inspected. During a file checking session, a location within the quarantine area may be created (step 900) when the first file that needs to be quarantined is detected. The quarantine location may be identified (step 910) by use of a unique identifier such as using the date and time of the file checking processes, the name of the file collection 300 that is being checked, the name of the target location 110 that is holding the altered file, and/or the name of the altered file itself.

Previous Doc Next Doc Go to Doc#

Hit List

First Hit Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 16 of 16 returned.

☐ 1. Document ID: US 20050033775 A1

Using default format because multiple data bases are involved.

L6: Entry 1 of 16 File: PGPB Feb 10, 2005

PGPUB-DOCUMENT-NUMBER: 20050033775
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050033775 A1

TITLE: File deletion and truncation using a zombie file space

PUBLICATION-DATE: February 10, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Ray	Campbell	CA	US
Edwards, John K.	Sunnyvale	CA	US
Patel, Kayuri	Cupertino	CA	US

US-CL-CURRENT: 707/200

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

☐ 2. Document ID: US 20040139273 A1

L6: Entry 2 of 16 File: PGPB Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040139273
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040139273 A1

TITLE: Space allocation in a write anywhere file system

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Doucette, Douglas P.	Freeland	WA	US
Lewis, Blake	Palo Alto	CA	US
Edwards, John K.	Sunnyvale	CA	US

US-CL-CURRENT: 711/100

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 3. Document ID: US 20040059866 A1

L6: Entry 3 of 16 File: PGPB Mar 25, 2004

PGPUB-DOCUMENT-NUMBER: 20040059866
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040059866 A1

TITLE: System and method for representing named data streams within an on-disk structure of a file system

PUBLICATION-DATE: March 25, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Patel, Kayuri	Cupertino	CA	US
Muhlestein, Mark	Tuscon	AZ	US

US-CL-CURRENT: 711/100

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 4. Document ID: US 20030182253 A1

L6: Entry 4 of 16 File: PGPB Sep 25, 2003

PGPUB-DOCUMENT-NUMBER: 20030182253
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030182253 A1

TITLE: System and method for restoring a single file from a snapshot

PUBLICATION-DATE: September 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Raymond C.	Campbell	CA	US
Patel, Kayuri	Cupertino	CA	US
Kahn, Andy C.	San Francisco	CA	US
Edwards, John K.	Sunnyvale	CA	US

US-CL-CURRENT: 707/1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 5. Document ID: US 20030167287 A1

L6: Entry 5 of 16 File: PGPB Sep 4, 2003

PGPUB-DOCUMENT-NUMBER: 20030167287
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030167287 A1

TITLE: Information protection system

PUBLICATION-DATE: September 4, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Forster, Karl	Paradise Valley	AZ	US

US-CL-CURRENT: 707/203

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 6. Document ID: US 20020083081 A1

L6: Entry 6 of 16 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020083081
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020083081 A1

TITLE: Manipulation of zombie files and evil-twin files

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Chen, Raymond C.	Campbell	CA	US
Edwards, John	Sunnyvale	CA	US
Patel, Kayuri	Cupertino	CA	US

US-CL-CURRENT: 707/200

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

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☐ 7. Document ID: US 20020083037 A1

L6: Entry 7 of 16 File: PGPB Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020083037
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020083037 A1

TITLE: Instant snapshot

PUBLICATION-DATE: June 27, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Lewis, Blake	Palo Alto	CA	US
Edwards, John	Sunnyvale	CA	US
Viswanathan, Srinivasan	Fremont	CA	US

US-CL-CURRENT: 707/1

☐ 8. Document ID: US 6952797 B1

L6: Entry 8 of 16 File: USPT Oct 4, 2005

US-PAT-NO: 6952797
DOCUMENT-IDENTIFIER: US 6952797 B1

TITLE: Block-appended checksums

DATE-ISSUED: October 4, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kahn; Andy	Santa Clara	CA	95050	
Sundaram; Rajesh	Mountain View	CA	94040	
Viswanathan; Srinivasan	Fremont	CA	94536	
Kleiman; Steven R.	Los Altos	CA	94022	

APPL-NO: 09/696666 [PALM]
DATE FILED: October 25, 2000

INT-CL-ISSUED: [07] G11 C 29/00, H03 M 13/00

US-CL-ISSUED: 714/770; 714/758
US-CL-CURRENT: 714/770; 714/758

FIELD-OF-CLASSIFICATION-SEARCH: 714/770, 714/758
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4761785	August 1988	Clark et al.	
5088081	February 1992	Farr	
5195100	March 1993	Katz et al.	
5208813	May 1993	Stallmo	

5235601	August 1993	Stallmo et al.	
5239640	August 1993	Froemke et al.	
5278838	January 1994	Ng et al.	
5283791	February 1994	Halford	714/766
5313626	May 1994	Jones et al.	
5341381	August 1994	Fuller	
5386425	January 1995	Kim	714/755
5392290	February 1995	Brown et al.	714/6
5517484	May 1996	Takagi et al.	
5537567	July 1996	Galbraith et al.	
5666511	September 1997	Suganuma et al.	711/114
5675726	October 1997	Hohenstein et al.	
5696775	December 1997	Nemazie et al.	
5758057	May 1998	Baba et al.	714/7
5765183	June 1998	Kojima et al.	
5864440	January 1999	Hashimoto et al.	360/53
5864655	January 1999	Dewey et al.	714/7
5903532	May 1999	Ikeda	
5948110	September 1999	Hitz et al.	
5963962	October 1999	Hitz et al.	
6006308	December 1999	Matsunami et al.	711/114
6317844	November 2001	Kleiman	
6637007	October 2003	Bots	

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
694 25 658	April 2001	DE	
0 462 917	December 1991	EP	
0 462 917	December 1991	EP	
0 462 917	December 1991	EP	
0 466 296	January 1992	EP	
0 492 808	July 1992	EP	
0 492 808	July 1992	EP	
0 559 488	September 1993	EP	
0 997 900	May 2000	EP	
0 702 815	August 2000	EP	
0 927 395	May 2003	EP	
07-261947	July 1996	JP	
WO 94/29807	December 1994	WO	
WO 03/009286	January 2003	WO	

OTHER PUBLICATIONS

IBM Technical Disclosure Bulletin, vol. 36 No. 03, Mar. 1993, "Parity Preservation for Redundant Array of Independent Direct Access Storage Device Data Loss Minimization and Repair". XP000354845.
Steven R. Kleiman et al., "Using NUMA Interconnects for Highly Available Filers", Jan.-Feb.

1999. IEEE.
Jai Menon et al., "The Architecture of a Fault-Tolerant Cached RAID Controller", IEEE Computer Society Press, Los Alamitos, California, May 16-19, 1993. XP000398988.
Slashdot. Tux2: "The Filesystem That Would Be King", Oct. 17, 2000.
IBM. "Automated Problem Reporting." IBM Technical Disclosure Bulletin, Nov. 1989, pp. 466-468, vol. 32, no. 6A.
Kegel. "Apache Problem Report Database." http://bugs.apache.org/, May 24, 1999.

ART-UNIT: 2133

PRIMARY-EXAMINER: Torres; Joseph D.

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

A method and apparatus for a reliable data storage system using block level checksums appended to data blocks. Files are stored on hard disks in storage blocks, including data blocks and block-appended checksums. The block-appended checksum includes a checksum of the data block, a VBN, a DBN, and an embedded checksum for checking the integrity of the block-appended checksum itself. A file system includes file blocks with associated block-appended checksum to the data blocks. The file blocks with block-appended checksums are written to storage blocks. In a preferred embodiment a collection of disk drives are formatted with 520 bytes of data per sector. For each 4,096-byte file block, a corresponding 64-byte block-appended checksum is appended to the file block with the first 7 sectors including most of the file block data while the 8.sup.th sector includes the remaining file block data and the 64-byte block-appended checksum.

18 Claims, 3 Drawing figures

☐ 9. Document ID: US 6910154 B1

L6: Entry 9 of 16 File: USPT Jun 21, 2005

US-PAT-NO: 6910154
DOCUMENT-IDENTIFIER: US 6910154 B1

TITLE: Persistent and reliable delivery of event messages

DATE-ISSUED: June 21, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schoenthal; Scott	San Ramon	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/642064 [PALM]

DATE FILED: August 18, 2000

INT-CL-ISSUED: [07] G06 F 11/00

US-CL-ISSUED: 714/18; 714/17
US-CL-CURRENT: 714/18; 714/17

FIELD-OF-CLASSIFICATION-SEARCH: 714/18, 714/17, 714/16, 714/15, 714/4, 714/12, 714/48
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4937763	June 1990	Mott	364/550
5067099	November 1991	McCown et al.	364/550
5224095	June 1993	Woest et al.	370/401
5265229	November 1993	Sareen	710/100
5423068	June 1995	Hecker	455/438
6119244	September 2000	Schoenthal et al.	714/4
6477564	November 2002	Freyssinet et al.	709/202
6519712	February 2003	Kim et al.	714/15
6545981	April 2003	Garcia et al.	370/242

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0537098	April 1993	EP	

OTHER PUBLICATIONS

Lowell, David E. and Chen, Peter M.; "Persistent Messages in Local Transactions", Jun. 1998; 17.sup.th ACM Symposium on Principles of Distributed Computing; Jun. 1998.
Borg, Anita et al.; "Fault Tolerance Under UNIX"; Feb. 1989; ACM Transactions on Computer Systems, vol 7, No. 1, Feb. 1989, pp. 1-247.

ART-UNIT: 2114

PRIMARY-EXAMINER: Baderman; Scott

ASSISTANT-EXAMINER: Lohn; Joshua

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

The invention provides a method and system for persistent and reliable delivery of event messages. Those parts of the system responsible for delivering event messages are able to persistently maintain those event messages until the intended recipient of the event message confirms delivery of those event messages. Those parts of the system responsible for recovering

from system crashes and other system errors are able to persistently maintain those event messages until delivery, even after recovery from system crashes or other system errors. The system includes a set of event message producers, and maintains an event-indication queue of those event messages provided by the event producers using a set of pre-allocated resources. An event-distribution engine distributes event messages to intended recipients and, after having received confirmation that the event messages were received, removes them from the event-indication queue. Recipients of event messages receive the event messages, acknowledge their receipt thereof, and might take action in response to the event message. The system includes persistent memory, initialization memory, and recipient persistent memories, and provides upon recovery from system crashes or other system error, an ability to replay event messages recorded in those memories, to re-present them as event messages. A cluster of file servers collectively forming a highly-available system shares persistent memories, so that upon a system crash or other system error, at least one other file server has a record of those event messages.

27 Claims, 4 Drawing figures

10. Document ID: US 6757695 B1

L6: Entry 10 of 16 File: USPT Jun 29, 2004

US-PAT-NO: 6757695
DOCUMENT-IDENTIFIER: US 6757695 B1

TITLE: System and method for mounting and unmounting storage volumes in a network storage environment

DATE-ISSUED: June 29, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Noveck; David B.	Lexington	MA		
Chen; Raymond C.	Campbell	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/925919 [PALM]
DATE FILED: August 9, 2001

INT-CL-ISSUED: [07] H06 F 17/30

US-CL-ISSUED: 707/200; 707/101
US-CL-CURRENT: 707/200; 707/101

FIELD-OF-CLASSIFICATION-SEARCH: 707/8, 707/102, 707/205, 710/8, 710/19, 710/302, 711/114, 711/118, 711/156, 714/4, 714/6
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5163131	November 1992	Row et al.	
5355453	October 1994	Row et al.	
5363487	November 1994	Willman et al.	710/8
5485579	January 1996	Hitz et al.	
5497457	March 1996	Ford	714/6
5802366	September 1998	Row et al.	
5819292	October 1998	Hitz et al.	
5931918	August 1999	Row et al.	
5941972	August 1999	Hoese et al.	
5948110	September 1999	Hitz et al.	714/6
5950225	September 1999	Kleiman	
5963962	October 1999	Hitz et al.	
5999930	December 1999	Wolff	707/8
6038570	March 2000	Hitz et al.	
6052692	April 2000	Anderson et al.	707/102
6065037	May 2000	Hitz et al.	
6119244	September 2000	Schoenthal et al.	714/4
6138126	October 2000	Hitz et al.	
6425035	July 2002	Hoese et al.	

OTHER PUBLICATIONS

U.S. Pending patent application entitled, Manipulation of Zombie Files and Evil-Twin Files, Ray Chen et al., Ser. No. 09/642,066, Filed: Aug. 18, 2000, all pages.
U.S. Pending patent application entitled, Operator Initiated Graceful Takeover in a Node Cluster, Cramer et al., Ser. No. 09/933,866, Filed: Aug. 20, 2001, all pages.

ART-UNIT: 2175

PRIMARY-EXAMINER: Mizrahi; Diane D.

ASSISTANT-EXAMINER: Mofiz; Apu

ATTY-AGENT-FIRM: Cesari and McKenna, LLP

ABSTRACT:

A system and method for mounting and unmounting volumes attached to a data storage system, such as a file server, tracks specific sub-states within each of the overall mounting and unmounting procedure states, in which specific file system requests are and are not allowed (as appropriate) with respect to the mounting/unmounting volume based upon the sub-state. More specifically, for mounting or unmounting, a storage operating system in the file server transitions a volume through a series of sub-states, as tracked in appropriate control structures. Each sub-state is characterized by a set of permitted operations that may be performed while the volume is in that sub-state, entrance and exit criteria for that sub-state, and restricted operations that may not be performed while the volume is that sub-state. During transaction request handling, the storage operating system validates each request against the sub-state to determine the disposition of the request. Then, depending on the request and the

sub-state, the storage operating system will execute the request, ignore the request, hold the request for later execution, or return an error message to the client originating the request.

24 Claims, 9 Drawing figures

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11. Document ID: US 6751635 B1

L6: Entry 11 of 16 File: USPT Jun 15, 2004

US-PAT-NO: 6751635
DOCUMENT-IDENTIFIER: US 6751635 B1

TITLE: File deletion and truncation using a zombie file space

DATE-ISSUED: June 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Chen; Ray	Campbell	CA		
Edwards; John K.	Sunnyvale	CA		
Patel; Kayuri	Cupertino	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/642066 [PALM]
DATE FILED: August 18, 2000

INT-CL-ISSUED: [07] G06 F 17/30

US-CL-ISSUED: 707/200; 707/10, 707/202, 707/206
US-CL-CURRENT: 707/200; 707/10, 707/202, 707/206

FIELD-OF-CLASSIFICATION-SEARCH: 707/10, 707/201, 707/203, 707/206, 707/204, 707/205, 707/200, 707/202, 711/113, 711/114, 709/203, 709/219, 709/229
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4888681	December 1989	Barnes et al.	707/101
4937763	June 1990	Mott	702/183
5067099	November 1991	McCown et al.	702/183
5088031	February 1992	Takasaki et al.	709/100
5155835	October 1992	Belsan	711/114

5193184	March 1993	Belsan et al.	711/4
5317728	May 1994	Tevis et al.	707/204
5403639	April 1995	Belsan et al.	707/204
5535375	July 1996	Eshel et al.	703/27
5557747	September 1996	Rogers et al.	709/223
5564037	October 1996	Lam	711/161
5617568	April 1997	Ault et al.	
5832522	November 1998	Blickenstaff et al.	707/204
5946685	August 1999	Cramer et al.	707/10
5963962	October 1999	Hitz et al.	707/202
5991753	November 1999	Wilde	707/2
5996054	November 1999	Ledain et al.	711/203
6026402	February 2000	Vossen et al.	
6041334	March 2000	Cannon	707/204
6101508	August 2000	Wolff	709/223
6112211	August 2000	Bradshaw et al.	707/205
6173293	January 2001	Thekkath et al.	707/201
6247024	June 2001	Kincaid	707/204
6249792	June 2001	Zwilling et al.	707/205
6289356	September 2001	Hitz et al.	707/201
6334114	December 2001	Jacobs et al.	705/26
6353878	March 2002	Dunham	711/162
6366988	April 2002	Skiba et al.	711/165
6529921	March 2003	Berkowitz et al.	715/500.1
2002/0083081	June 2002	Chen et al.	
2002/0089508	July 2002	Sowizral et al.	345/522

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
694 25 658	August 2000	DE	400/332.4
0 474 395	August 1991	EP	
0537098	April 1993	EP	
702 815	August 2000	EP	
WO 94/29807	December 1994	WO	
WO 00/11553	March 2000	WO	
WO 02/19110	August 2001	WO	

OTHER PUBLICATIONS

Rodriquez et al., A new Checkpoint Mechanism for real time Operating System, Undated, Univerdisad Politecnica de Madrid, Spain, pp. 55-62.*
Ott et al., SRED: Stabilized RED, undated, Bellcore and Bell Laboratory, pp. 1-10.*
Chung et al., Checkpointing in CosMiC: a User-level Process Migration Environment, 1997 IEEE, pp. 187-193.*
Elnozahy et al., A Survey of Rollback-Recovery Protocols in Message-Passing Systems, ACM Computing surveys, vol. 34, No. 3, Sep. 2002, pp. 375-408.*
Kleiman et al.; Using NUMA Interconnects For Highly Available Filers; IEEE Micro. 1999; pp. 42-48. XP002164052.

Chia Chao et al., "Mime: A High Performance Storage Device With Strong Recovery Guarantees", Concurrent Systems Project, HP Laboratories, Mar. 18, 1992.
Dave Hitz, James Lau & Michael Malcolm, Network Appliance, Technical Report 3002, Rev. C 3/95, "File System Design for an NFS File Server Appliance", Usenix Winter 1994, San Francisco, CA, 1994 The Usenix Association, Jan., 1994.
David Hitz, "Technical Report TR01: An NFS File Server Appliance", Rev. A 8/93, Network Appliance Corporation, Santa Clara, CA.
Mulqueen, John T., Product Analysis Review. Communications Week, vol. 452, p. 25, May 3, 1993.
John Ousterhout & Fred Douglis, "Beating the I/O Bottleneck: A Case for Log-Structured File Systems". Electrical Engineering and Computer Sciences, UC Berkeley, CA, Oct., 1988.
Network Appliance. Data ONTAP Event Management System, Aug. 10, 2000.
David Simpson, "`Appliances` Take Over File Server Role", Digital News and Review, vol. 11, No. 6, pp. 1-2, Mar. 21, 1994.
TUX 2: Slashdot.com TUX 2 "The File System That Would Be King", Microsoft Internet Explorer, Oct. 20, 2000.
Gray et al. "Transaction processing: Concepts and techniques." 1993, Morgan Kaufmann, San Francisco, pp. 724-732.
Hutchinson et al. "Logical vs. physical file system back up." Third Symposium on Operating Systems Design and Implementation, New Orleans, LA, USA, Feb. 22-25, 1999, pp. 239-249.

ART-UNIT: 2177

PRIMARY-EXAMINER: Homere; Jean R.

ASSISTANT-EXAMINER: Wong; Leslie

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

A method and system for reliably performing extra-long operations in a reliable state-full system (such as a file system). The file system includes a separate portion of the file system reserved for files having extra-long operations in progress, including file deletion and file truncation. This separate portion of the file system is called the zombie file space; it includes a separate name space from the regular ("live") file system that is accessible to users, and is maintained as part of the file system when recording a consistency point.

27 Claims, 4 Drawing figures

☐ 12. Document ID: US 6728922 B1

L6: Entry 12 of 16 File: USPT Apr 27, 2004

US-PAT-NO: 6728922
DOCUMENT-IDENTIFIER: US 6728922 B1

TITLE: Dynamic data space

DATE-ISSUED: April 27, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY

Sundaram; Rajesh	Mountain View	CA
Viswanathan; Srinivvasan	Fremont	CA
Rowe; Alan	San Jose	CA
Kleiman; Steven R.	Los Altos	CA
Edwards; John K.	Sunnyvale	CA

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/642062 [PALM]
DATE FILED: August 18, 2000

INT-CL-ISSUED: [07] G11 C 29/00

US-CL-ISSUED: 714/769; 714/763, 714/770
US-CL-CURRENT: 714/769; 714/763, 714/770

FIELD-OF-CLASSIFICATION-SEARCH: 711/162, 707/204, 707/102, 714/763, 714/764, 714/769, 714/770
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4527232	July 1985	Bechtolsheim	
4742447	May 1988	Duvall et al.	
4742450	May 1988	Duvall et al.	
4761785	August 1988	Clark et al.	
4875159	October 1989	Cary et al.	
4937763	June 1990	Mott	364/550
5008786	April 1991	Thatte	
5043876	August 1991	Terry	
5067099	November 1991	McCown et al.	364/550
5088081	February 1992	Farr	
5144659	September 1992	Jones	
5146588	September 1992	Crater et al.	
5155835	October 1992	Belsan	
5163131	November 1992	Row et al.	
5163148	November 1992	Walls	
5195100	March 1993	Katz et al.	
5218695	June 1993	Noveck et al.	
5218696	June 1993	Baird et al.	
5222217	June 1993	Blount et al.	
5235601	August 1993	Stallmo et al.	
5274799	December 1993	Brant et al.	
5274807	December 1993	Hoshen et al.	
5297265	March 1994	Frank et al.	

5305326	April 1994	Solomon et al.	
5315602	May 1994	Noya et al.	
5333305	July 1994	Neufeld	
5335235	August 1994	Arnott	
5357509	October 1994	Ohizumi	
5379417	January 1995	Lui et al.	
5490248	February 1996	Dan et al.	
5502836	March 1996	Hale et al.	
5649152	July 1997	Ohran et al.	
5668943	September 1997	Attanasio et al.	
5668958	September 1997	Bendert et al.	
5675726	October 1997	Hohenstein et al.	
5678006	October 1997	Valizadeh et al.	
5737744	April 1998	Callison et al.	
5742752	April 1998	DeKoning	
5819292	October 1998	Hitz et al.	
5819310	October 1998	Vishlitzky et al.	
5828876	October 1998	Fish et al.	
5829046	October 1998	Tzelnic et al.	711/162
5835953	November 1998	Ohran	
5907672	May 1999	Matze et al.	
5948110	September 1999	Hitz et al.	
5950225	September 1999	Kleiman	
5963962	October 1999	Hitz et al.	
6000039	December 1999	Tanaka et al.	
6061770	May 2000	Franklin	711/162
6076148	June 2000	Kedem	
6101585	August 2000	Brown et al.	
6119244	September 2000	Schoenthal et al.	
6138126	October 2000	Hitz et al.	
6397229	May 2002	Menon et al.	707/204
6578041	June 2003	Lomet	707/102

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0 462 917	December 1991	EP	
0 492 808	July 1992	EP	
0 497 067	August 1992	EP	
0537098	April 1993	EP	
0 552 580	July 1993	EP	
0 569 313	November 1993	EP	
WO 91/13404	September 1991	WO	
WO 93/13475	July 1993	WO	
WO 94/29796	December 1994	WO	
WO 98/21656	May 1998	WO	

WO 98/38576	September 1998	WO
WO 00/07104	February 2000	WO
WO 01/31446	May 2001	WO

OTHER PUBLICATIONS

Chia Chao et al., "Mime: a High Performance Storage Device with Strong Recovery Guarantees", Concurrent Systems Project Hewlett-Packard Laboratories, Mar. 18, 1992.
Wiebren De Jonge, "The Logical Disk: A new Approach to Improving File Systems", Dept. of Mathematics and Computer Science, Vrije Universiteit, Amsterdam.
Jim Gray et al., "Parity Striping of Disc Arrays: Low-Cost Reliable Storage with Acceptable Throughput", Proceedings of the 16.sup.th VLDB Conference, Brisbane, Australia 1990. Tandem Computers Inc., 19333 Vallco Parkway, Cupertino, California. XP000522459.
John H. Hartman, "The Zebra Striped Network File System", Computer Science Division, Electrical Engineering and Computer Sciences, University of California, Berkeley, California.
David Hitz, "File System Design for an NFS Server Appliance", Technical Report 3002, Presented Jan. 19, 1994. Usenix Winter 1994, San Francisco, California.
David Hitz, "An NFS File Server Appliance", Technical Report TR01, Rev. A 8/93.
IBM Technical Disclosure Bulletin, vol. 36, No. 03, Mar. 1993. XP000354845.
Steven R. Kleiman et al., "Using NUMA Interconnects for Highly Available Filers", 1999 IEEE.
Jai Menon et al., "The Architecture of a Fault-Tolerant Cached RAID Controller", IEEE Computer Society, Los Alamitos, California, May 16-19, 1993. XP000398988.
David Patterson et al., "A Case for Redundant Arrays of Inexpensive Disks (RAID)", Computer Science Division, Dept. of Electrical Engineering and Computer Sciences, University of California, Berkeley.
Slashdot, TUX 2: "The File System that Would Be King".
David Tweeten, "Hiding Mass Storage Under UNIX: Nasa's MSS-II Architecture", NAS Systems Division, NASA Ames Research Center, Moffett Filed, California, 1990 IEEEE.

ART-UNIT: 2133

PRIMARY-EXAMINER: Ton; David

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

A data storage system, such as RAID, upgraded dynamically including multiple stages, providing error checking data without taking the system off-line. Checksums are computed from the data and placed in block 63 of the same disk. The combination of parity bits across the parity disk, the remaining uncorrupted data in the data disks, and checksums within each disk includes sufficient information to enable restoration of corrupt data. The system is upgraded by reserving permanent checksum blocks, writing the checksums to a volume block number, and placing the checksums in permanently reserved checksum block locations after first moving data already there to unreserved blocks.

42 Claims, 3 Drawing figures

13. Document ID: US 6643654 B1

L6: Entry 13 of 16 File: USPT Nov 4, 2003

US-PAT-NO: 6643654
DOCUMENT-IDENTIFIER: US 6643654 B1
** See image for Certificate of Correction **

TITLE: System and method for representing named data streams within an on-disk structure of a file system

DATE-ISSUED: November 4, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Patel; Kayuri	Cupertino	CA		
Muhlestein; Mark	Tuscon	AZ		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/891159 [PALM]
DATE FILED: June 25, 2001

INT-CL-ISSUED: [07] G06 F 17/00

US-CL-ISSUED: 707/10; 709/217, 711/100
US-CL-CURRENT: 707/10; 709/217, 711/100

FIELD-OF-CLASSIFICATION-SEARCH: 707/1-10, 707/100-104, 707/200-206, 711/100-116, 711/117-146, 709/212-237
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5819292	October 1998	Hitz et al.	
5948110	September 1999	Hitz et al.	
6038570	March 2000	Hitz et al.	
6178483	January 2001	Runaldue et al.	711/137
6230200	May 2001	Forecast et al.	709/219
6496899	December 2002	DeMoney	711/112

OTHER PUBLICATIONS

Sheth et al., Data structure distribution and multi-threading of Linux file system for multiprocessors, High Performance Computing, 1998, HIPC '98 5th International Conference On, Dec. 17-20, 1998, pp. 97-104.*
Hsiao et al., Performance evaluation of cache depot on CC-NUMA multiprocessors, Parallel and Distributed Systems, 1998, Proceedings, 1998, International Conference on, Dec. 14-16, 1998, pp. 519-526.*
Brewer et al., The evolution of the HP/Convex Exemplar, Compcon '97, Proceediings, IEEE, Feb. 23-26, 1997, pp. 81-86.*

U.S. patent application Ser. No. 09/642,066, Ray Chen et al., filed Aug. 18, 2000.
SNIA Storage Networking Industry Association; Common Internet File System (CIFS), Version: CIFS-Spec 0.9. Draft SNIA CIFS Work Grouip Work-in-Progress.

ART-UNIT: 2175

PRIMARY-EXAMINER: Jung; David

ATTY-AGENT-FIRM: Cesari and McKenna, LLP

ABSTRACT:

A technique provides on-disk representations of multiple named data streams for a file system of a network storage appliance. The network storage appliance or filer includes a file system that implements a Write Anywhere File Layout (WAFL) disk format, wherein files are described by inodes of which there may be various types, including directory and regular inodes. A named stream inode type is defined that represents named data streams in the WAFL file system. Multiple data streams may be stored on disk(s) of the filer as representations embodying the named stream inode type associated with a file. The names and file handles of the data streams are stored in a "hidden" directory within the file system that is referenced by the base mode. The hidden directory is represented as a stream_dir inode type.

29 Claims, 8 Drawing figures

☐ 14. Document ID: US 6636879 B1

L6: Entry 14 of 16 File: USPT Oct 21, 2003

US-PAT-NO: 6636879
DOCUMENT-IDENTIFIER: US 6636879 B1

TITLE: Space allocation in a write anywhere file system

DATE-ISSUED: October 21, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Doucette; Douglas P.	Freeland	WA		
Lewis; Blake	Palo Alto	CA		
Edwards; John K.	Sunnyvale	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Network Appliance, Inc.	Sunnyvale	CA			02

APPL-NO: 09/642065 [PALM]
DATE FILED: August 18, 2000

INT-CL-ISSUED: [07] G06 F 17/30

US-CL-ISSUED: 707/205
US-CL-CURRENT: 707/205

FIELD-OF-CLASSIFICATION-SEARCH: 707/201, 707/202, 707/203, 707/204, 707/205, 360/48, 369/30.09, 711/165, 711/173, 714/4, 714/6
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4527232	July 1985	Bechtolsheim	
4742447	May 1988	Duvall et al.	
4742450	May 1988	Duvall et al.	
4761785	August 1988	Clark et al.	
4875159	October 1989	Cary et al.	
4937763	June 1990	Mott	702/183
5008786	April 1991	Thatte	
5043876	August 1991	Terry	
5067099	November 1991	McCown et al.	702/183
5088081	February 1992	Farr	
5144659	September 1992	Jones	
5146588	September 1992	Crater et al.	
5155835	October 1992	Belsan	
5163131	November 1992	Row et al.	
5163148	November 1992	Walls	
5195100	March 1993	Katz et al.	
5218695	June 1993	Noveck et al.	
5218696	June 1993	Baird et al.	
5222217	June 1993	Blount et al.	
5235601	August 1993	Stallmo et al.	
5274799	December 1993	Brant et al.	
5274807	December 1993	Hoshen et al.	
5297265	March 1994	Frank et al.	
5305326	April 1994	Solomon et al.	
5315602	May 1994	Noya et al.	
5333305	July 1994	Neufeld	
5335235	August 1994	Arnott	
5357509	October 1994	Ohizumi	
5379417	January 1995	Lui et al.	
5490248	February 1996	Dan et al.	
5502836	March 1996	Hale et al.	
5649152	July 1997	Ohran et al.	
5668943	September 1997	Attanasio et al.	
5668958	September 1997	Bendert et al.	
5675726	October 1997	Hohenstein et al.	

5678006	October 1997	Valizadeh et al.	
5737744	April 1998	Callison et al.	
5742752	April 1998	DeKoning	
5819292	October 1998	Hitz et al.	707/203
5819310	October 1998	Vishlitzky et al.	
5828876	October 1998	Fish et al.	
5835953	November 1998	Ohran	
5907672	May 1999	Matze et al.	
5948110	September 1999	Hitz et al.	
5950225	September 1999	Kleiman	
5963962	October 1999	Hitz et al.	707/201
6000039	December 1999	Tanaka et al.	
6038570	March 2000	Hitz et al.	707/204
6076148	June 2000	Kedem	
6101585	August 2000	Brown et al.	
6119244	September 2000	Schoenthal et al.	
6138126	October 2000	Hitz et al.	707/202
6289356	September 2001	Hitz et al.	707/201

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0 462 917	December 1991	EP	400/332.5
0 492 808	July 1992	EP	
0 497 067	August 1992	EP	
0537098	April 1993	EP	
0 552 580	July 1993	EP	
0 569 313	November 1993	EP	
WO 91/13404	September 1991	WO	
WO 93/13475	July 1993	WO	
WO 94/29796	December 1994	WO	
WO 98/21656	May 1998	WO	
WO 98/38576	September 1998	WO	
WO 00/07104	February 2000	WO	
WO 01/31446	May 2001	WO	

OTHER PUBLICATIONS

Chia Chao et al., "Mime: a High Performance Storage Device with Strong Recovery Guarantees", Concurrent Systems Project Hewlett-Packard Laboratories, Mar. 18, 1992.
Wiebren De Jonge, "The Logical Disk: A new Approach to Improving File Systems", Dept. of Mathematics and Computer Science, Vrije Universiteit, Amsterdam.
Jim Gray et al., "Parity Striping of Disc Arrays: Low-Cost Reliable Storage with Acceptable Throughput", Proceedings of the 16.sup.th VLDB Conference, Brisbane, Australia 1990. Tandem Computers Inc., 19333 Vallco Parkway, Cupertino, California. XP000522459.
John H. Hartman, "The Zebra Striped Network File System", Computer Science Division, Electrical Engineering and Computer Sciences, University of California, Berkeley, California.
David Hitz, "File System Design for an NFS File Server Appliance", Technical Report 3002, Presented Jan. 19, 1994. USENIX Winter 1994, San Francisco, California.

David Hitz, "An NFS File Server Appliance", Technical Report TRO1, Rev. A 8/93.
IBM Technical Disclosure Bulletin, vol. 36, No. 03, Mar. 1993. XP000354845.
Steven R. Kleiman et al., "Using NUMA Interconnects for Highly Available Filers", 1999 IEEE.
Jai Menon et al., "The Architecture of a Fault-Tolerant Cached RAID Controller", IEEE Computer Society, Los Alamitos, California, May 16-19, 1993. XP000398988.
David Patterson et al., "A Case for Redundant Arrays of Inexpensive Disks (RAID)", Computer Science Division, Dept. of Electrical Engineering and Computer Sciences, University of California, Berkeley.
Slashdot, TUX 2: "The File System that Would Be King".
David Tweeten, "Hiding Mass Storage Under UNIX: Nasa's MSS-II Architecture", NAS Systems Division, NASA Ames Research Center, Moffett Filed, California, 1990 IEEEE.

ART-UNIT: 2175

PRIMARY-EXAMINER: Mizrahi; Diane D.

ASSISTANT-EXAMINER: Mofiz; Apu M

ATTY-AGENT-FIRM: Swernofsky Law Group PC

ABSTRACT:

A method and system for improving data access of a reliable file system is provided. In a first aspect of the invention, the file system determines the relative vacancy of a collection of storage blocks, herein called an "allocation area". This is accomplished by recording an array of binary numbers. Each binary number in the array describes the vacancy of a collection of storage blocks. The file system examines these binary numbers when attempting to record file blocks in relatively contiguous areas on a storage medium, such as a hard disk. When a request to write to disk occurs, the system determines the average vacancy of all the allocation areas and queries the allocation areas for individual vacancy rates such as sequentially. The system preferably writes file blocks to the allocation areas that are above a threshold related to the average storage block vacancy of the file system. If the file in the request to write is larger than the selected allocation area, the next allocation area above the threshold is preferably used to write the remaining blocks of the file.

39 Claims, 3 Drawing figures

☐ 15. Document ID: US 20020083081 A1

L6: Entry 15 of 16 File: DWPI Jun 27, 2002

DERWENT-ACC-NO: 2002-583165
DERWENT-WEEK: 200262
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TITLE: File system operating method for file server system, involves recording changes to the zombie file space of a file system in a persistent memory

INVENTOR: CHEN, R C; EDWARDS, J ; PATEL, K

PRIORITY-DATA: 2001US-0932579 (August 17, 2001), 2000US-0642066 (August 18, 2000)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 20020083081 A1	June 27, 2002		014	G06F012/00

INT-CL (IPC): G06 F 12/00

ABSTRACTED-PUB-NO: US20020083081A
BASIC-ABSTRACT:

NOVELTY - The method involves recording changes to the zombie file space of a file system in a persistent memory.

USE - For file server system.

ADVANTAGE - Enables reliable execution of extra-long operations in a file system.

DESCRIPTION OF DRAWING(S) - The figure shows the block diagram of a portion of a file system.

16. Document ID: US 20050033775 A1, WO 200219110 A2, EP 1311948 A2, US 6751635 B1

L6: Entry 16 of 16 File: DWPI Feb 10, 2005

DERWENT-ACC-NO: 2002-339696
DERWENT-WEEK: 200512
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TITLE: File system operating method where file system includes live file space accessible to users and zombie file space not accessible to users recording changes to zombie file space in persistent memory

INVENTOR: CHEN, R; EDWARDS, J K ; PATEL, K

PRIORITY-DATA: 2000US-0642066 (August 18, 2000), 2004US-0868189 (June 15, 2004)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 20050033775 A1	February 10, 2005		000	G06F007/00
WO 200219110 A2	March 7, 2002	E	027	G06F011/00
EP 1311948 A2	May 21, 2003	E	000	G06F011/14
US 6751635 B1	June 15, 2004		000	G06F017/30

INT-CL (IPC): G06 F 7/00; G06 F 11/00; G06 F 11/14; G06 F 17/30

ABSTRACTED-PUB-NO: WO 200219110A
BASIC-ABSTRACT:

NOVELTY - The method involves recording changes to a zombie file space in a persistent memory. The method further involves transferring a file from live file space to the zombie file space. Links associating disk blocks with the file are broken in several steps while the file is associated with the zombie file space. The recording of changes includes recording the breaking of links in several steps. The live file space is altered to reflect the deletion operation.

USE - For file server systems in which it is desired to maintain file system consistency.

ADVANTAGE - Provides technique for extra-long operations in a reliable state-full system (such as a file system) that is not subject to known drawbacks.

DESCRIPTION OF DRAWING(S) - The figure shows a file structure in a system using a zombie file space.

Term	Documents
ZOMBIE	193
ZOMBIES	57
FILE	1069695
FILES	176001
(ZOMBIE NEAR FILE).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	16
((ZOMBIE NEAR FILE)).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	16

Freeform Search

Database: US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Term: (zombie near file)

Display: 100 **Documents in Display Format:** - **Starting with Number** 1

Generate: ○ **Hit List** ◉ **Hit Count** ○ **Side by Side** ○ **Image**

Search Clear Interrupt

Search History

DATE: Saturday, January 07, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L7	L6 and filespace	3	L7
L6	(zombie near file)	16	L6
L5	L4 and (zombie near file)	0	L5
L4	L3 and (deletion near file)	7	L4
L3	inaccessible near file	158	L3
L2	virtual near filespace	2	L2
L1	zombie near filespace	3	L1

END OF SEARCH HISTORY

Freeform Search

Database: US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Term: L8 and filespace

Display: 100 **Documents in Display Format:** FRO **Starting with Number** 1

Generate: ○ **Hit List** ◉ **Hit Count** ○ **Side by Side** ○ **Image**

Search Clear Interrupt

Search History

DATE: Saturday, January 07, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR			
L9	L8 and filespace	3	L9
L8	(deletion near file)	1483	L8
L7	L6 and filespace	3	L7
L6	(zombie near file)	16	L6
L5	L4 and (zombie near file)	0	L5
L4	L3 and (deletion near file)	7	L4
L3	inaccessible near file	158	L3
L2	virtual near filespace	2	L2
L1	zombie near filespace	3	L1

END OF SEARCH HISTORY